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ABSTRACT
          A recent finding that good and poor readers may bring
different response patterns to the reading task comes from a pilot
study in which so-called good readers achieved a higher score on a
comprehension test than did poor readers, even when they had not had
a paragraph or story to read as a basis for answering the questions.
This study was a more systematic attempt to replicate the findings of
the pilot study and a test of the formulation that reading is more
than the decoding of visual material. Sixteen good and sixteen poor
seventh grade readers were given comprehensive questions taken from a
standard reading test under four conditions: graphic form/story and
questions, graphic form/questions only, auditory form/story and
questions, and auditory form/questions only. It was hypothesized that
under the questions only condition and the stories and questions
condition, good readers would score higher than poor readers on both
modes of presentation; And, although poor readers may score better on
the auditory presentation than on the graphic, their performance
would still be lower than that of the good readers. The data show
that, while the groups did differ for the most part as predicted,
good readers scored lowest for the graphic form/questions only
condition. The implications of these findings are discussed. (TO)

FINAL REPORT

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Do Reading Tests Measure "Reading"

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Summary

The study reported here was (1) a more systematic attempt to replicate the findings of a pilot study by Cromer and Anderson which found that good readers relative to poor readers in the seventh grade had more correct answers on a reading test even when they did not have the paragraph available to read, and (2) a test of the formulation that "reading" is more than the decoding of visual material. Sixteen good readers were carefully matched to 16 poor readers and given comprehensive questions taken from a standard reading test (Iowa Silent Reading Test, New Edition, Elementary Level) under four conditions (1) Graphic form/story and questions, (2) Graphic form/questions without first seeing the story, (3) Auditory form/story and questions and (4) Auditory form/questions without first hearing the story. It was hypothesized that (1) under the questions only condition, good readers will score significantly higher than poor readers on both the graphic and auditory modes of presentation; (2) under the stories and questions condition, good readers will score significantly higher than poor readers under both the graphic and auditory modes of presentation; (3) although poor readers may score better on the auditory modes of presentation (in that the materials are preorganized for them) than on the graphic modes, their performance even on the auditory mode will be lower than that of the good readers.

The data which consisted of the number of questions answered correctly under the four conditions, were only partially consistent with these hypotheses. While the groups did differ for the most part as predicted, the one discrepant finding was that the good readers scored lowest of all for the graphic presentation/question only condition. A discussion of the implications of these findings and of the unreliability of the classification of subjects as a good or a poor reader on the three criteria used in this study was attempted.

Introduction

In some earlier writing, Wiener and Cromer (1967) analyzed "reading" and reading difficulty and suggested that the term reading (i.e., comprehension) might best be conceptualized as a highly complex set of interrelated sequential behaviors for dealing with graphic materials. In considering reading difficulties, Wiener and Cromer held that general difficulties rather than those specific to the decoding of graphic materials per se may better account for failure to "read." That is, reading difficulty has been used as a catch-all concept, yet a good number of instances labelled reading "difficulties" could better be assigned to difficulties with other behavior sequences. (e.g., mastery of language patterns, kinds of organization imposed on the material to be read, limited "intelligence," vocabulary" deficiencies" or differences, different language pattern usages).

Within this kind of conceptualization it is apparent that if one were to attempt to help individuals who do not achieve the end product of comprehending graphic materials, it is important to identify what it is specifically that the subject brings to the task which is different and/or inadequate for the task to be performed. In contrast to other approaches, this view holds that for most readers beyond the early acquisition stages, the difficulties for the reader do not seem to reflect reading skill deficiencies in the usual sense of the word (e.g., word identification or word-naming skills, phonics, knowledge of grammar), but for the most part seem to be a function of patterns of behaviors which also occur in tasks other than reading (e.g., in listening to the same kinds of complex language forms).

If the "difficulties" are apparent in other behavior sequences, as well as when someone is reading, then it is not logical to concentrate on the reading activity per se as a means of remediation. Rather, it may be more fruitful to locate the patterns of behaviors the subject brings to reading (e.g., particular language behavior, organization pattern, other linguistic variables, experiential backgrounds) which may account for a non-match of behaviors which are required in the behavior sequences important for adequate reading comprehension. When these forms of behaviors are identified it may be easier to try to modify the particular behavior patterns which are different or even deficient in contexts other than a reading task. In fact, to concentrate on reading to effect remediation may itself be counter-productive to getting the person to "enjoy" and to "approach" reading as an information source. In sum, if there is anything novel in this approach, it is its focus on the many other things the child already knows and does prior to coming to the reading task (responses which are also required in a reading task) rather than the typical approaches which seem to locate the difficulties primarily in the decoding or taking of information from the printed material activity itself, as if the behaviors involved in reading were specific only to this activity.

The most general statement of the perspective that leads to the study reported here is that reading like other "perceptual" activity may best be understood in terms of what the perceiver brings to the task for a particular set of stimuli. Whatever the merits of this approach, it leads to a search for a "match" (mismatch) between what the

perceiver (reader) brings to the task in relation to the requirements of the task rather than a search for deficiencies within the reader. In this kind of context, the emphasis is on the differences in the typical behavior sequences of the reader compared to the task requirements of the text.

A series of studies have been undertaken to try to explore this approach. For example, it has been found that so-called good and poor readers differ in the same ways in responses to auditory language as they do for graphic language. Oakan, Wiener, and Cromer (1970) found that poor readers relative to carefully matched good readers showed less comprehension that good readers for poorly organized auditory material. In this study, the contention was offered that since so-called poor readers organize the graphic materials in a strange way making "reading" or comprehension difficult, that were the same material presented to them auditorily, comprehension would be as difficult. Given a passage "read" aloud by a poor reader, poor readers apparently fail to impose organization and comprehend the material less well than do good readers for this particular form of verbalization.

Further, Oakan (1973), again using carefully matched good and poor readers (i.e., sex, classroom, intelligence score) assessed the verbal production of these readers and found a large and significantly lesser degree of subordination (relative to coordination) used by poor readers relative to his good readers in telling a story to a picture. Oakan constructed two sets of stories to be comprehended; one set was in coordinated grammatical form (i.e., "and," "then" or in single sentences, etc.) versus subordinated form (i.e., "after," "while," "that," etc.). The task was presented both graphically and auditorily. Oakan found that for stories written with coordinated forms, there was no apparent difference between good and poor readers; for the identical stories written with subordinated language forms, the differences between good and poor readers were significant. These same findings were evident whether the stories were presented graphically or auditorily.

A more recent finding that good and poor readers may bring different response patterns to the reading task comes from a pilot study (Cromer and Anderson, un-published) in which it was found that so-called "good" readers achieved a higher score on a comprehension test than did "poor" readers, even when they had not had a paragraph or story to read as a basis for answering the questions. In this study, an attempt was made to demonstrate that those behavior patterns a student brings to the test situation independent of input contribute to standard reading test scores. All of the students in an eighth grade (N = 287) were administered (1) a standard administration of a reading test (part of a school testing procedure) and (2) an alternate form of the standard reading test given two months later as part of an experimental procedure. The primary difference between the standard and the experimental administrations of the test was that in the second instance, the series of multiple-choice questions to be answered referred to a passage which was not

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available to be read. Thus, essentially, the task was to "guess" the correct alternative from a list of four answers. Based on their initial percentile scores for the standard administration, subjects were divided into five groups (i.e., using standard norms, scores of 1-19% were included in the first group, with those scoring 8C-99% in the fifth group). For each of these groups, the mean number of questions answered correctly on each of the two test administrations were compared. The better the reader on a standard test, the better was the score on a test without text. For the lowest percentile reader group, the mean score on the experimental test (no passages) was significantly higher than the mean score on the standard test. For the other groups, the mean score on the experimental test was significantly lower than for the standard test; and the greater the difference between standard and experimental administrations, the higher the level of reading ability (see Table 1).

There is, however, a limiation in the Cromer and Anderson pilot study in that the differences noted between good and poor readers in the condition when comprehension questions only were presented could be explained by differences between these groups in "reading," that is, dealing with the visual material of the questions themselves. While this explanation is possible, it is not likely since Table 1 shows that the poorest readers (i.e., 1-19% Reading Level) performed better without the text available. However, it is important and necessary to replicate and extend the findings of Cromer and Anderson.

The present study then is an attempt to replicate the results of Cromer and Anderson, while introducing more systematic controls (e.g., matching good and poor readers for intelligence test scores, for socio-economic backgrounds, and for sex) and by including a questions only condition as well as in the more typical format of stories followed by questions, each presented both graphically and auditorily.

The present study attempts: (1) to determine to what extend differences between "good" and "poor" readers on a standard reading comprehension test can be attributed to factors other than reading of the test passages and/or reading of the comprehension questions by exploring "comprehension" with and without a test to be comprehended, and (2) to assess the extent to which differences between good and poor readers can be attributed to the visual activity, or what is commonly meant by "reading," by comparing comprehension for visual presentation versus auditory mode of presentation. The specific hypotheses to be explored were:

(1) Under the questions only condition, good readers will score significantly higher than poor readers on both the graphic and auditory modes of presentation.

(2) Under the stories and questions condition, good readers will score significantly higher than poor readers under both the graphic and auditory modes of presentation.

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Table 1

Means scores on the standard test and on the experimental test
for the five levels reading comprehension ability

| Reading Level | N | Mean scores | | |
		Standard Test	Experimental Test	Difference
1-19%	63	10.84	13.71	+3.13
20-39%	78	15.77	14.63	-1.14
40-59%	54	20.39	14.93	-5.46
60-79%	59	24.93	16.52	-8.41
80-99%	33	30.27	18.39	-11.88

(3) Although poor readers may score better on the auditory modes of presentation (in that the materials are preorganized for them),than on the graphic modes, their performance even on the auditory mode will be lower than that of the good readers.

Method

Subjects

The subjects for this experiment were 16 poor readers and 16 good readers in the fifth grade of a New England public school system in a middle-class community (selected from a pool of 24 subject pairs who met the criterion listed below). The poor reader group included 8 boys and 8 girls reading at least 1 1/3 years below grade level as measured on a standardized reading test (Iowa Test of Basic Skills, Grade 5). The good reader group included 8 boys and 8 girls reading at or above grade level as measured by the same reading test.

A matched-pairs design was used, with each good/poor reader pair matched for school, grade, classroom, sex, and age and IQ score (based on the Large Thorndike Test, Level IV, administered routinely by the school system during the previous year). For each pair, the poor reader scored at least 1.5 years below his matched good reader on the reading section of the Iowa Test of Basic Skills.

Two additional criteria were met by each poor reader before he/she was included in the group. First, the teacher who knew him/her best had to agree (through a response on a standard form) that the potential subject had problems with "reading." Second, the current functioning of the subject on the experimental condition where material was presented in paragraph form (which is exactly the same situation as one of the subtests of the standard reading test previously administered and used as a basis of the initial assignment to subject categories) was lower than that of his matched good reader. In each instance where a good reader did not perform at least one point better than his matched poor reader, both members of the pair were set aside (although these subjects are included in supplemental analyses, to be discussed later). Thus, to be labelled a poor reader, an individual subject (1) had to have been performing below grade level the previous year, (2) had to be considered a poor reader by the teacher who best knew his reading skills, and (3) had to be functioning currently at a level below his matched pair subject.[1]

For poor readers, the reading test scores on the standard test ranged from .5 to 4.1, with a mean score of 3.3; for good readers, scores ranged from 5.1 to 6.3, with a mean score of 5.7. The intelligence test scores for the poor reader

group ranged from 80 to 107, with a mean of 94.9; for the good reader group the range was 84 to 101, with a mean score of 94.4.[2]

General Procedure

All of the children who participated in the experiment had parental permission; a letter was sent home requesting their approval. All subjects were tested by the same experimenter, within their own schools. Each subject was seen for two sessions, one in which subjects were tested in groups of four for approximately 35 minutes (auditory condition), and one in which subjects were tested in either of two groups of 16 for approximately 30 minutes (visual condition). Each child was told very clearly and explicitly that he was participating in a project which had nothing to do with his/her schoolwork or his/her grades. General questions were answered by the experimenter in an attempt to put the subjects at ease before beginning the experimental tasks.

Materials and Specific Procedures

The stimuli, a series of eight stories each with ten questions in a multiple-choice format, were taken from Part A of each of the four forms of the Iowa Silent Reading Test (New Edition, Elementary Level, Forms Am, Bm, Cm, Dm; Harcourt Brace and World, Inc., 1967). Two stories were selected from each of the four alternate forms, making four sets of stories of comparable length and assumed to be of comparable difficulty. Twenty questions to test reading comprehension were available for each set of stories and were used exactly as they appeared in the test, including their titles.[3]

Each of the sets of stories was presented in the following four different conditions:

(1) Graphic/stories and questions is the usual format for presenting reading tests; in fact, for this condition the materials were cut from the individual test booklets (with the permission of the publisher) and stapled to standard size sheets of white paper. The instructions were typed immediately above the story and were worded as follows: "Read this story carefully. There will be questions when you are done. The title appears above the story." After the subject had read the story, he was instructed to turn to the next page of the booklet, where he read the following instructions: "Read the questions and mark down the answers which are correct for the story." These instructions were repeated for the second story in the set.

(2) Graphic/questions only is the condition which consisted of two sheets of paper, each containing a set of instructions, the title of the story, and ten

multiple-choice questions. Thus, there was no body of material, to be read but only a series of questions to be answered. The following instructions preceded the first title and set of questions:

> Make believe you have just read a story. Here are some questions. Even though you did not read the story, you try to answer the questions as if you had read the story. The title of the story appears above the questions. Read the questions and mark down the answers which you think would be correct if you had read the story.

After the ten questions were answered, the subject turned to the next page, where the following instructions preceded the questions:

> Now here are questions for another story. Try to answer the questions as if you had read the new story. The title of the story appears above the questions. Read the questions and mark down the answer which you think would be correct if you had read the story.

(3) Auditory/stories and questions is the condition comparable to (1) but presented orally through the use of a tape-recorder, which made it possible for the condition to be exactly the same for each subject. The materials were read and recorded by an individual who is highly experienced in reading to the blind; her diction, etc. is particularly clear and her accent minimal. For this condition, the instructions were given orally: "Listen to this story carefully--I will ask you questions when I am done--the title of the story is..." At the completion of the story, there was a pause followed by the instruction to "listen to the question and mark down the answer that is correct for the story. Use the answer sheet in front of you. Question one..." She then read each question and three alternate answers; each subject merely made a mark on the answer sheet. The experimenter provided the materials, played the tape-recorder, and made certain that each subject understood the instructions.

·(4) Auditory/questions only was similar to condition (2) and also was presented via a tape-recorder, with the instructions being essentially those of the written condition (see above). Each subject answered questions on a form exactly the same as in the auditory/stories and questions condition.

Thus, there were four sets of stories and four conditions under which each set could be presented. The four sets of stories were distributed equally over the four conditions; however, sequence and order were only partially counter-balanced, with each set occurring with the same frequency in each position.

Each subject participated in two sessions. All subjects received the two auditory conditions first. For these conditions, the subjects were seen in groups of four, sitting at desks but facing away from each other within close proximity of the tape-recorder. Each group of four subjects contained two good and two poor readers. Overall, half of the subjects received the auditory/questions only condition first while the other half received the auditory/stories and questions condition first.

The second session for each subject, the graphic conditions, was completed by presenting the material to two groups of 16 subjects. One group had the questions only condition first while the other group of 16 subjects had the stories and questions condition first. Each subject was given a booklet and allowed to do the test at his/her own pace.

Results

The data for each subject consisted of the number of correct ꭓers for each of the four conditions: (1) Graphic/stories and questions, (2) Graphic/questions only, (3) Auditory/stories and questions, (4) Auditory/questions only. The maximum score for any condition was 20, which would indicate that all of the multiple-choice questions were answered correctly.

The data were analyzed utilizing a four-way analysis of variance with repeated measurements. This design treats each pair of good and poor readers as one subject, tested under different conditions, a procedure which maximizes the strengths of a matched-pairs technique for assigning subjects.[4]

The four main effects tested by the analysis of variance were: (1) Reading ability (poor versus good readers), (2) Order (a combination of sequence of presentation and the four forms of stories used to test comprehension), (3) Mode of presentation (auditory versus graphic presentation of materials), and (4) Amount of information (stories and questions versus questions only conditions).

A summary of the results of the analysis of variance computed on the comprehension number-correct scores is presented in Table 2.

The difference between the means for the experimental condition Reading ability was significant ($F_{1,8} = 21.36$, $p < .001$). Overall, good readers answered more questions correctly than did poor readers.

The main effect for Amount of Information was significant ($F_{1,8} = 82.08$, $p < .001$). Overall, more questions were answered correctly under the Stories condition than under the Questions Only conditions for both groups of subjects under both graphic and visual conditions.

Table 2

Analysis of Variance of Comprehension Number Correct Scores of 16
Matched Pairs of Good and Poor Readers for Two Modes of Presentation
(Auditory or Graphic) and Two Amounts of Information (Stories or Questions Only)

Source	df	MS	F	P
Total	127	11.070		
Between	15	13.931		
Order (Or)	7	9.656	0.54	
Pooled Individuals (PI)	8	17.671		
Within	112	10.687		
Reading ability (RA)	1	87.781	21.36	< .001
OR RA	7	4.191	1.02	
PI RA	8	4.109		
Mode of Presentation (auditory/graphic)(AV)	1	18.000	1.33	
OR AV	7	9.125	0.67	
PI AV	8	13.515		
Amount of Information (stories/questions only)(SQ)	1	504.031	82.08	< .001
OR SQ	7	0.763	0.12	
PI SQ	8	6.140		
RA AV	1	0.000	0.00	
OR RA AV	7	3.053	0.70	
PI RA AV	8	4.328		
RA SQ	1	63.281	11.09	< .05
OR RA SQ	7	1.227	0.21	
PI RA SQ	8	5.703		
AV SQ	1	0.125	0.02	
OR AV SQ	7	4.071	0.65	
PI AV SQ	8	6.234		
RA AV SQ	1	32.000	40.15	< .001
OR RA AV SQ	7	1.160	1.45	
PI RA AV SQ	8	0.796		

The main effect for Mode of Presentation was not significant ($F_{1,8} = 1.33$) nor was the main effect for Order ($F_{9,8} = .54$). Thus, there were no consistent overall differences between groups when the materials were presented either graphically or auditorally, nor was there evidence that either Order or Form (differences among the four sets of stories) contributed systematically to the overall results.

There was a significant difference ($F_{1,8} = 11.09$, $p < .05$) for the two way interaction of Reading ability and Amount of Information. However, the significant three-way interaction between Reading ability, Amount of Information, and Mode of Presentation ($F_{1,8} = 40.15$, $p < .001$) would seem to be most appropriate to analyze to test the hypotheses of this study.

Table 3 presents the me in number of correct responses (out of a total possible of 20) for each of the experimental conditions for the two subject populations.

As expected, the good readers comprehended besi under the Graphic/story condition (m = 14.13) with the poor readers scoring an average of four points lower on the same condition (m = 10.06).[5] Also as expected, the poor readers performed best on the Auditory/Story mode (m = 11.88) compared to all other scores.

However, it is interesting to add that even under the Auditory/Story condition, where visual decoding was not a part of the information gathering process, the good readers (m = 13.94) continued to perform better than the poor readers (m = 11.88). This finding is also supported by the results of the Auditory/Questions only conditions: again, the poor readers "guessed" fewer correct answers (m = 8.25) than did the good readers (m = 9.50) on this condition where no materials were presented other than the title of the imagined story.

One finding, however, clearly goes against the expectations of this study. Under the questions only condition of the graphic mode of presentation, the good readers showed the lowest mean of all conditions (m = 7.81) doing even less well than the poor readers under the same condition (m = 8.56).

The results also support the expectation that poor readers were less affected by the absence of stories (questions only condition) than were the good readers on the graphic mode of presentation. By eliminating the stories as a source of information in answering the questions, the good reader score dropped an average of 6.31 points, whereas the poor reader score dropped an average of 1.50 points. This variation in scores was so large for the good readers that under the graphic/questions only condition they scored lower than their paired poor readers. However, even had they "guessed" only as well as the poor reader the drop for the good reader would still have been about 5 points.

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Table 3

Mean Comprehension (Number-Correct) Scores of 16 Matched Pairs
of Good and Poor Readers for Two Modes of Presentation
(Graphic or Auditory) and Two Amounts of Information (Stories/Questions Only)

	Graphic		Auditory	
	Story	Questions Only	Story	Questions Only
Good readers	14.13	7.81	13.94	9.50
Poor readers	10.06	8.56	11.88	8.25

Supplemental analyses

In addition to the above analysis, three other analyses were computed utilizing all of the subjects, including those subjects who were eliminated from the original sample because they did not meet the criterion of functioning on the test situation consistently with their group label (i.e., the subject pairs where the poor reader had a higher score than his matched good reader on the graphic/stories condition). The eight pairs who were eliminated from the original sample for this reason were then included in these three supplemental analyses to determine their effects on the overall findings.

In the first of the supplemental analyses, the scores of the 16 non-used subjects were compared in an analysis of variance similar to that used for the experimental subjects. In the second analysis, these 16 subjects were combined with the original subjects using the original standard test score criterion for assigning them to good or poor reading groups. It was then possible to compare 24 good and 24 poor readers. In the third analysis, the 16 additional subjects were assigned to good or poor groups based on their performance (relative to their matched pairs) on the experimental story and questions task (the same technique as Cromer, 1970, where subjects were assigned to their good/poor reader categories based on an estimate of "current" functioning). In this latter case, the eight pairs were thus switched and then combined with the original 32 subjects. In this supplemental analysis, then, all good and poor reader pairs were defined in terms of their experimental task performance, rather than on their standard reading test score.

Tables 4, 5, and 6 present the summary of the means for the critical task conditions. The analyses of variance on the three supplemental analyses are given in Appendix B. Essentially these results are similar to those of the original analysis except that overall the magnitudes of the differences between groups and conditions are reduced by the addition of these 16 subjects.

Table 4 shows that overall the so-called poor readers performed as the good readers did in the original analyses, that is they did best on the story forms but least well on the graphic/questions only form. There is no evidence that these groups differ on the auditory condition.

The only finding of interest in Table 5 is the "higher" score for good readers relative to the poor reader for all conditions, but particularly for the story and questions condition for both auditory and graphic forms.

Table 6 shows only that good readers relative to poor readers, but categorized by this additional requirement, have a higher score for the story and questions task for the graphic condition.

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Table 4

Mean Comprehension (Number-Correct) Scores of the 16 Good and Poor Readers (not used in the original grouping) for Two Modes of Presentation (Graphic or Auditory) and Two Amounts of Information (Stories or Questions Only)

| | Graphic | | Auditory | |
	Story	Questions Only	Story	Questions Only
Good readers	10.52	9.88	12.38	9.13
Poor readers	12.00	7.50	12.13	9.75

Table 5

Mean Comprehension (Number-Correct) Scores of the 32 Original Paired Subjects Combined with Additional (N = 16) Good and Poor Readers Categorized on the Basis of Their Standard Test Scores for the Two Modes of Presentation (Graphic or Auditory) and Two Amounts of Information (Stories or Questions Only)

| | Graphic | | Auditory | |
	Story	Questions Only	Story	Questions Only
Good readers	12.92	8.50	13.42	9.38
Poor readers	10.67	8.21	11.96	8.75

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Table 6

Mean Comprehension (Number-Correct) Scores of the 32 Original Paired Subjects
Combined with Additional 16 Good and Poor Readers Cat. gorized on the Basis of
Their Score on the Graphic Story Condition for the Two Modes of Presentation
(Graphic or Auditory) and Two Amounts of Information (Stories or Questions Only)

	Graphic		Auditory	
	Story	Questions Only	Story	Questions Only
Good readers	13.67	8.04	13.17	9.71
Poor readers	9.96	8.67	12.21	8.42

Discussion

Overall, the results of this study only partially support the original hypothesis that good and poor readers differ significantly on other dimensions than whether or not they derive information from graphic-verbal material and that these other dimensions contribute systematically to their overall test performance. If poor readers (so-called) were comparable to good readers in all tasks save that of "reading," then the two groups should be comparable on the auditory/stories and auditory/questions only conditions, which was not the case. Thus, even when asked to listen to stories and respond to questions presented orally, the poor readers as a group averaged two points (number of questions answered correctly) lower than the good readers.

There is evidence that poor readers, like good readers, did receive some information from the stories. That is, under both visual and auditory conditions, they answered more questions correctly when they had the stories present than when they had only the titles of the stories and were to guess which answer they might think was correct. However, both good and poor readers consistent y "guessed" the correct answers on the questions only condition at a greater than chance frequency under both visual and auditory conditions. This finding suggests that at least this reading test (we would argue that this effect would be found for most, if not all reading tests) presents a task which a subject can perform without having access to the material he/she ostensibly was required to master.

One finding which was unexpected and for which we have no adequate explanation is that on the graphic/questions only condition, the poor readers guessed more answers correctly than did the good readers. Although this overall difference is less than one point, it is in a direction opposite to that expected. Given a similar finding in the second of the supplemental analyses, where a subject was classified as a good or poor reader by his/her performance on the experimental task graphic/ stories and questions condition, it is possible that there is some artifact in the pairing of the forms and stories which make some stories or questions more difficult. However, our original analysis found no such significant effects and at least for the moment, we have no ready answer available to account for this consistent, but anomalous finding that the best performers on the graphic materials/question and answers did least well on the graphic materials/questions only condition, performing lower on auditory materials/questions and answers.

Two tentative conclusions can be offered from the overall finding. First, for both good and poor readers, the stories do provide some information which is reflected in their comprehension scores. Second, the test scores also seem to reflect other variables as well, and these seem differentially available to good and poor readers. Further research is needed to separate out the possible additional variables, that is, differing types of experiences among different reading groups. For example, good

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readers tend to read more than poor readers, have differential degrees of familiarity with English language, may respond differentially to the contents of the stories, and may have variations in the availability of various guessing strategies.

A discussion of the present study would be incomplete if it did not focus on some of the specific difficulties encountered. These difficulties may have implications for anyone attempting to do systematic research on children with "reading" difficulties. First, there were difficulties in the selection of subjects. As in previous studies, several criteria were used: performance on previously administered reading tests, assessment by teachers, and current task performance. As in previous studies, it has been demonstrated that these three criteria do not necessarily correlate. Starting with a pool of 500 fifth grade students, we ultimately found 16 poor readers and 16 good readers who met all three criteria and could be matched on intelligence tests, sex, and classroom (to control for such variables on socio-economic class differences, teachers, etc.); these 32 subjects met the most stringent requirements for assignment to the good and poor reader groups. These good readers performed better than the poor readers on the visual/stories condition and on the auditory mode, although the difference between the two groups was smaller for the auditory than for the comparable visual condition. Incidentally, the poor readers also do less well than the good readers on the auditory/questions only condition, a finding which is consistent with the original hypothesis. For this group, the finding which is most difficult to explain is on the visual/questions only condition where the good readers do least well of all conditions for both groups. This finding remains difficult to explain.

If we now look at the 8 pairs of subjects who did not meet the experimental task performance criteria and were excluded from the original group, it is interesting to note that in this analysis the poor readers, who actually had the higher scores on graphic/stories and questions task, performed on the visual/questions only condition similarly to the good readers in the first analysis. Thus, again the higher the score on the visual/stories condition the lower the score on the visual/questions only condition.

When we look at the finding where these 8 pairs of subjects are combined with the 32 acceptable subjects, first by standard test criteria and second by experimental task performance, other results become apparent. In both instances, the results are similar to the original analysis except that the magnitude of the effects are decreased. By adding subjects who do not meet the most stringent requirements, we find a decrease in the effects of the experimental tasks.

In sum, while there were some findings consistent with the original hypothesis, we do not replicate the findings of Cromer and Anderson. Recall that one problem with the Cromer and Anderson study was that it did not control adequately for possible differences in the intelligence scores of good and poor reader groups, nor did it

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eliminate the issue of a "reading" requirement in the question only condition.

If we reconsider the study and the results relative to Cromer and Anderson, we begin to wonder if perhaps we have not selected an unusual group of good and poor readers in that we have been so careful to match them in terms of many other variables uncontrolled in other studies. We have suggested that this matching procedure would possibly mitigate against finding evidence consistent with the hypotheses, (that is to the extent that reading ability and intelligence are positively correlated, we may be systematically excluding all but a select group whose scores on the particular task did not correlate either for good or poor readers).

In terms of plans for future research, the most obvious need is to replicate the present study with new materials and subjects, if only to try to account for the finding that on the visual/questions only condition all subjects who performed best on graphic materials with a story do least well of all conditions on the graphic questions only condition.

In replicating this study, it might be preferable to use somewhat older subjects, perhaps junior high school pupils. First, using more advanced subjects would allow us a wider range of reading behavior from which to select subjects such that a larger difference between pairs would be possible. Second, and more importantly, testing subjects who are more advanced might allow for a more clear demonstration of the effects being hypothesized and which were first found in a pilot group of seventh graders. As reading tests measure more accomplished language users, the focus becomes more on subtleties of material and less on identification of the task. If this factor were the case, we could predict that comparisons of older children might well show the effects we posit.

Footnotes

[1] The stringency of these requirements were considered to be necessary in that findings in previous research (e.g., Cromer, 1970) demonstrated that standard reading test performance alone is not an adequate predictor of reading performance on an equivalent reading task.

[2] If anything, equality of intelligence scores should work against the hypotheses. To the extent that intelligence scores may include a reading "skills" requirement, a poor reader with an intelligence test score comparable to his matched good reader would have a "higher intelligence" than his matched pair in that his score would show the effect of the "reading" impairment.

[3] Titles of the four sets of stories were the following: Set One: "Dictating Machines" and "The Spanish Conquistadors," Set Two: "Slate" and "Life in a Castle in Olden Times," Set Three: "Petrified Forests" and "Weather Forecasting," Set Four: "Sugar Cane" and "Storming a Castle in Olden Times."

[4] A second analysis of variance was done eliminating the repeated measurements conditions so that each member of a pair was treated as a separate subject. The results of this analysis are presented in table form in Appendix A. This analysis yielded the same set of results as the analysis detailed in the body of this report.

[5] Recall that any pair which did not meet the requirement of at least a one point difference in favor of the "good" reader was eliminated from the study.

Appendix A

Analysis of Variance of Comprehension (Number-Correct) Scores of
Good and Poor Readers for Two Modes of Presentation (Auditory or Graphic)
And Two Amounts of Information (Stories or Questions Only)

Source	df	MS	F	p
Total	127	11.070		
Between	31	11.579		
Reading ability (RA)	1	87.781	8.060	<.05
Order (OR)	7	9.656	0.886	
RA OR	7	4.191	0.384	
Pooled Individuals (PI)	16	10.890		
Within	96	10.906		
Mode of Presentation (Auditory/Graphic)(AV)	1	18.000	2.017	
RA AV	1	0.000	0.000	
OR AV	7	9.125	1.022	
RA OR AV	7	3.053	0.342	
PI AV	16	8.921		
Amount of Information (Stories vs. Questions Only) (SQ)	1	504.031	85.113	<.001
RA SQ	1	63.281	10.686	<.05
OR SQ	7	0.763	0.128	
RA OR SQ	7	1.227	0.207	
PI SQ	16	5.921		
AV SQ	1	0.125	0.035	
RA AV SQ	1	32.000	9.102	<.05
OR AV SQ	7	4.071	1.158	
RA OR AV SQ	7	1.160	0.330	
PI AV SQ	16	3.515		

Appendix B.1

Mean Comprehension (Number Correct) Scores of 16 Matched Pairs of Good and
Poor Readers for Two Modes of Presentation (Graphic or Auditory)
And Two Amounts of Information (Stories or Questions Only)

Source	SS	df	MS	F	P
Total	1963.916	191	10.282		
Between	507.916	47	10.806		
Reading ability (RA)	63.020	1	63.020	6.516	<.05
Pooled Individuals (PI)	444.895	46	9.671		
Within	1456.000	144	10.111		
Mode of Presentation (Auditory or Graphic)(AV)	30.083	1	30.083	3.808	
RA AV	0.520	1	0.520	0.065	
PI AV	363.395	46	7.899		
Amount of Information (Stories or Questions Only)(SQ)	602.083	1	602.083	129.281	<.001
RA SQ	22.687	1	22.687	4.871	
AV SQ	0.333	1	0.333	0.065	
RA AV SQ	3.520	1	3.520	0.739	
PI AV SQ	219.145	46	4.764		

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Appendix B.2

Mean Comprehension (Number-Correct) Scores of the 16 Good and Poor Readers (not used in the original grouping) for Two Modes of Presentation (Graphic or Auditory) and Two Amounts of Information (Stories or Questions Only)

Source	SS	df	MS	F	P
Total	557.437	63	8.848		
Between	148.437	15	9.895		
Reading ability (RA)	7.562	1	7.562	0.751	
Pooled Individuals (PI)	140.875	14	10.062		
Within	409.000	48	8.520		
Mode of Presentation (AV)	12.250	1	12.250	1.324	
RA AV	6.250	1	6.250	0.675	
PI AV	129.500	14	9.250		
Amount of Information (SQ)	115.562	1	115.562	34.514	$<.05$
PI SQ	46.875	14	3.348		
AV SQ	0.250	1	0.250	0.056	
RA AV SQ	36.000	1	36.000	8.161	$<.05$
PI AV SQ	61.750	14	4.410		

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Appendix B.3

Mean Comprehension (Number-Correct)Scores of the 32 Original Paired Subjects
Combined with Addition (N=16) Good and Poor Readers Categorized on the Basis of
Their Standard Test Scores for the Two Modes of Presentation (Graphic or Auditory) and
Two Amounts of Information (Stories or Questions Only)

Source	SS	df	M	F	P
Total	1963.916	191	10.282		
Between	507.916	47	10.806		
Reading ability (RA)	85.333	1	85.333	9.286	<.001
Pooled Individuals (PI)	422.583	46	9.186		
Within	1456.000	144	10.111		
Mode of Presentation (AV)	30.083	1	30.083	3.824	
RA AV	2.083	1	2.083	0.264	
PI AV	361.833	46	7.865		
Amount of Information (SQ)	602.083	1	602.083	146.603	<.001.
RA SQ	47.999	1	47.999	11.687	<.001
PI SQ	188.916	46	4.106		
AV SQ	0.333	1	0.333	0.097	
RA AV SQ	65.333	1	65.333	19.101	<.001
PI AV SQ	157.333	46	3.420		

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